THE GEOLOGY OF PICACHO BUTTE, A SILICIC VOLCANIC DOME IN NORTHWEST ARIZONA

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Picacho Butte is a prominent physiographic feature located in Yavapai County in northwestern Arizona along the southern margin of the Colorado Plateau approximately 96 kilometers west of Flagstaff, Arizona. Picacho Butte has a local relief of 381 meters, rising to a maximum elevation of 2185 meters above sea level (fig. 1).

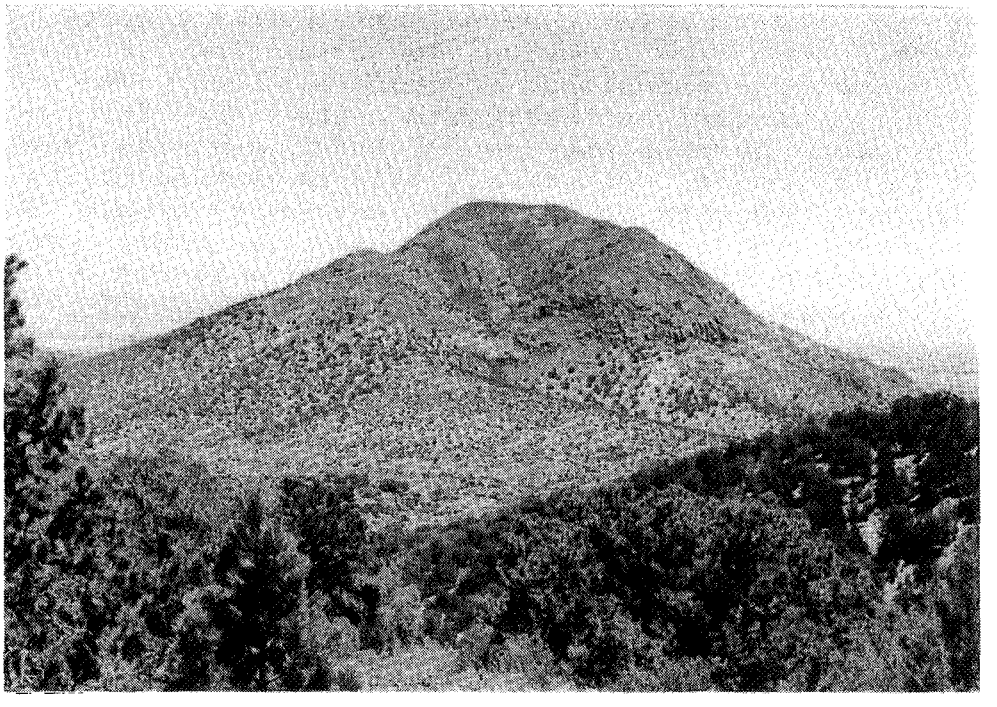

Figure 1. View of Picacho Butte to the east from 1.8 km away.

The purpose of this investigation was to determine the geologic history of Picacho Butte and vicinity through careful mapping of a 38 square kilometer area surrounding the peak. A detailed analysis of the geochemistry and petrology will aid in the development of a petrogenetic model for the area. The relationship of Picacho Butte to regional volcanism in Arizona, and more specifically to nearby volcanic centers can thus be established. Furthermore, in conjuction with this study a search will be made for possible planetary analogs exibiting photogeologic characteristics similar to those in northern Arizona.

Picacho Butte may be the oldest silicic center in the Mount Floyd volcanic field. A K-Ar age obtained by Goff and others (1983) shows Picacho Butte to be 9.8 ± 0.6 m.y. old. Mount Floyd, approximately 19 km north of Picacho Butte is 2.7 ± 0.7 m.y. old (Nealey, 1980). An apparent northward progression of silicic volcanism in the Mount Floyd volcanic field (Nealey, 1980) may be structurally controlled by zones of weakness in the lower crust, associated with a northeast and northwest lineament system traversing the Colorado Plateau (Eastwood, 1974). Faults may have been instrumental in the linear spatial relationship between some silicic centers on the southern Colorado Plateau.

Picacho Butte is a circular dome, less than two kilometers in area which has been extensively eroded. Erosion has exposed the core of the volcano, revealing a dike complex on the western side. The dike complex is comprised of pink and lavender brecciated hornblende rhyodacite flows. The dome is covered by a veneer of colluvium, shed by the volcano. Contacts between the dome and the surrounding strata are thus difficult to determine. Relatively well preserved cinder cones in the vicinity compared to the more severely eroded Picacho Butte suggests that the silicic dome is older than the surrounding basalt flows. Furthermore, no evidence exsists of silicic units overlying basalts in the map area.

Mapping indicates that the volcanic rocks are bimodal, like many late Cenozoic fields associated with the extensional tectonic regime prevelant during this time (Christiansen and Lipman, 1972). The rocks consist of olivine basalts and hornblende rhyodacites. They were classified on the basis of field relationships, color, texture, phenocryst and xenolith contents. The dome is composed of pale pink to dark pink and gray to lavender flow banded hornblende rhyodacites. Elongate hornblende needles are often aligned parallel to the flow banding. The flow banded rhyodacites contain abundant anhedral phenocrysts of plagioclase up to 3mm in diameter, as well as phenocrysts of quartz and biotite. Massive gray, lavender and pink flow breccia is found in the lower sections of the dome. The flow banded rock often grades into the massive flow breccia. Flow structures and flow folding are characteristic of the Picacho Butte silicic lavas. The rhyodacites are glassy in areas, particularly in the massive flow breccia units. The summit contains some gray and pink non-banded rhyodacites.

The dominant volcanic rocks in the area are basalts in the form of massive and vesicular flows. These basalts overlie the Pennsylvanian-Permian Supai Formation. Cinder cones, bombs and radiating dikes also occur. An eroded vent in the northwestern part of the map area has three vertical dikes intersecting an eroded exposed lava lake. The flows are typically fine to

medium grained gray to black olivine basalts with variable amounts of black clinopyroxene and extremely fine grained plagioclase phenocrysts. Flows north of Picacho Butte contain rounded xenoliths of felsic, mafic and ultramafic composition in variable amounts. In some flows they are locally abundant while in others they are rare. A basalt flow to the south of Picacho Butte older than those immediately to the north contained abundant quartz.

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